ISSN NO: 2769-996X
Date of Publication: 07-10-2022

Quality of Service: Traffic prioritization

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Abstract: In this article, we will see what Quality of Service is, its parameters and tasks, the principle of operation, traffic prioritization, and at the same time how its main work is carried out. QoS traffic prioritization technology will help ensure the smooth transmission of data that is of paramount importance.

Key words: Quality of Service, prioritization, traffic prioritization

QoS is used to solve the problem of reliability. QoS is a set of technologies for ensuring efficient data transmission in conditions of limited network capabilities. So, if the channel resources are not enough to download video and IP-telephony, you can make settings in such a way as to ensure stable quality of telephone conversations and high speed of downloading video files. The main parameters by which QoS is assessed are:

- delay - characterizes the degree of delay in data transfer;
- itter - displays changes in the delay in sending packets, which causes network congestion, data loss is possible;
- packet loss — number of unsent (lost) packets;
- bandwidth — channel bandwidth.

QoS technologies provide control over the characteristics mentioned above. With the help of tools, data losses and time delays in sending them are reduced. The requirements for the quality of the transmission channel are determined by the type of traffic. So, video and audio information is distorted in case of failures. When sending telemetry data (physical quantities, technical indicators), delays do not matter much, it is much more important to avoid packet losses, to minimize them. By correct prioritization, the order of traffic processing is regulated depending on its type. As a result, the quality of data transmission is improved - at the same speed, more information can be transmitted with less losses and delays;

- 100% control over the processes of data transfer in the network - confidence that strategically important data will be transferred in full;
- support for optimal channel bandwidth for IP-telephony, TV, multimedia content;
- Protection against DoS attacks.

Traffic prioritization is especially relevant when there is a significant load on the network, when the parameters of the information channel are clearly not enough to send all the data at the same time. What happens if you prioritize data transfers at home? The data transfer rate will decrease. This will happen even if one laptop or smartphone is connected to Wi-Fi. Traffic prioritization is in demand in corporate, converged networks (with combined servers and network resources) designed to transmit audio and video traffic simultaneously with other types of data. Main options:

- IP-telephony connected via the public Internet;
- remote servers that provide IP-telephony are connected to the main one;
- a corporate account in Skype is connected to the server via the Internet.

In the cases described above, a corporate router is used to transmit traffic, due to which, during calls, the quality of communication is sometimes insufficient due to oppression by data traffic. For example, if at the time of communication one of the employees downloads drawings, videos - that is, when the channel is overloaded.

How does QOS work? How to ensure 100% traffic transfer? There are 2 ways available: increase the priority of the stream, restrict other types of traffic. This is done through prioritization or bandwidth throttling. Main steps:

1. Traffic separation. Each is assigned a specific class. Classification features: port, IP address, application, user.

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2. Setting the rules. Using the available QoS tools, the conditions for passing traffic are set in accordance with the assigned class.

When the channel capacity is insufficient to carry multiple data streams, priority traffic categories are sent first. Non-priority packets are in the storage buffer until the network is unloaded.

Bandwidth regulation is carried out by limiting the information transfer rate, increasing the bandwidth, and other technologies. The service model is understood as a set of technologies and tools that are used to manage the priority of traffic. QoS has 3 options:

1. Best Effort Service. Without the use of traffic controls. Quality improvement is achieved by increasing the bandwidth, which is not always efficient enough. This solution is not suitable for IP-telephony, video conferencing and video communications.

2.Integrated service. Integrated service. A certain part of the channel is reserved along the entire data path: from the start point to the end point. This happens using the RSVP protocol. This solution provides the required throughput. The main disadvantage is that even when the channel is not loaded or not used at all, the resource is still reserved.

3.Differentiated service. differentiated service. Organized using special components, including classifiers, as well as formatting tools traffic. This model involves classification, labeling of packages, and regulation of the intensity of information flows. The PHB step-by-step service (stands for Per-Hop Behavior) is also involved.

Let's dwell on DiffServ in more detail, since it is he who is mainly used. Peculiarities:

- division of traffic into classes;
- a set of tools for processing classes;
- the concept of PHB and Per-Hop Behavior - the node recognizes the header of the incoming packet, and then processes it in accordance with the specified conditions.

The network provides several behaviors, the number of which is limited. Let's see how this happens in practice:

1. A data packet arrived at the node and received a certain class (for example, "1", "2", "3" and so on).
2. Measurement (Metering) - determination of the amount of information in the package.
3. Priority assignment (Coloring): priority (green) - within the set limit, less priority (yellow) - over the set limit, last (red).
4. Choice of action (Policing). At this stage, the stream is passed on, discarded (Dropper), re-marked.
5. Queue. In fact, there are several queues - for each class a separate one.
6. Restriction (Shaper). Traffic is limited to the specified value.

The result is a single output data stream. This can be compared to an 8-lane highway that narrows to 4 lanes - if there is no regulation, chaos will arise, and if you set the order of the movement of cars, everyone will pass quickly and with the least delay.

Classification consists in assigning a particular class to a package. Marking - in fact, the definition of priority. There are 3 ways to set a class:

1. Behavior Aggregate (BA). As labeled in the title. The number of classes is limited, so there is an aggregation of different types of traffic in a class.
2. Interface-based (IB). The class is assigned to traffic that arrives on a specific interface. For example, an employee's PC.
3. MultiField (MF). IP and MAC addresses, ports, arbitrary fields are analyzed.

Information flows are classified according to the following parameters: IP, incoming interface, QoS class specified in the header, ToS service type value (IP header), and MPLS EXP (MPLS header). The next stage is marking the flows, linking the packet with the original characteristic, for which special fields are allocated in the headers of the network protocols:

1. Ethernet. CoS (Class of Service), 3 bits - serves to divide traffic into 8 streams.
2.IP. DiffServ, a 6-bit Differencial Service Code Point field is additionally provided to indicate the characteristics for this type of traffic.
3.DSCP. These fields are generated by IP phones.
4. Custom fields. They are specified by applications, for example, peer-to-peer networks.

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Let's summarize. At the entrance to the DS domain, there are 3 ways to assign a class - IB, BA, MF, between nodes - only one, BA. The method of classification at the input does not matter, inside the domain the flow moves with the inner class, in accordance with it, it is processed, at the output the inner class is converted into the CoS of the new header.

Let's figure out how to enable QoS. The priority is set on the device page (the address depends on the model, often - 192.168.1.1). You should log in to the system (look for the username / password in the instructions for the device), go to the “NAT” tab, then “QoS”. Click "enable", the parameters for the port are WAN, for Packet Scheduler and Queueing Discipline are the default.

In the new models, everything is implemented extremely conveniently: it is enough to arrange the services in order of priority - just change the order. For more detailed control and in some router models, the following prioritization options are available:

1. Service (Services Priority). Let's say there is a need for unhindered access to Netflix from any device. Go to Services Priority and select Netflix, after which you set a certain priority for it: Maximum, remium, Standard, Express, Bulk.
2. Interface. This refers to the technology of connecting to the Internet: Wi-Fi, Ethernet, ADSL, and so on. Set the highest priority for wired connections, the lowest for wireless. It is possible to set the maximum upload / download speed for specific connections.
3. IP address. Traffic priority for specific PCs and tablets (if the IP address is static).
4. MAC address. As a rule, it is located on the device label or in the software settings.

QoS in IP telephony is implemented in two ways:

1. In the web interface of the router. You need to enter the device page in the browser, and then set priorities. Main parameters: SIP/RTP protocol, ports, traffic category.
2. In the software for making a call Open the network settings, mark the traffic.

Depending on the router model, the process may differ. QoS (Quality of Service) is a set of technologies for managing the quality of Internet communications. Basic moments:

- QoS is used to increase the bandwidth of the channel, reduce packet loss, improving the quality of IP-telephony.
- Setting priorities is carried out by assigning a class and marking, according to which the device sets the order of processing different types of traffic.
- There are 3 service models: Best Effort Service (by default), Integrated Service (preliminary reservation of a resource regardless of the workload), Differentiated Service.
- DiffService involves prioritization of packets in accordance with the header, classification is provided, tools for processing classes.
- The router is configured on the device page: "Settings" - "NAT" - "QoS".

QoS makes it possible to provide optimal conditions for the passage of priority information.

Thus, in conclusion, we can say that priority traffic is sent on "preferential terms", and the rest - depending on the bandwidth and channel parameters. Setting priorities makes it possible to improve the quality of communication, which is extremely important for business and the development of this area.

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ISSN NO: 2769-996X
Date of Publication: 07-10-2022

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